UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Terves LLC, Plaintiff, vs. Yueyang Aerospace New Materials Co., Ltd., and Ecometal Inc., and Nick Yuan, Defendants.	))))))))))))))))))	Case No. 1:19-cv-1611 JUDGE DONALD C. NUGENT

DECLARATION OF DR. DANA J. MEDLIN,
PH.D., P.E., FASM ADDRESSING PROPOSED CLAIM
TERMS TO BE CONSTRUED AND PROPOSED CONSTRUCTIONS

I, Dana J. Medlin, declare as follows:

I. INTRODUCTION

1. I have prepared this Declaration in response to the parties' proposed terms to be construed and constructions of those terms.

II. QUALIFICATIONS

2. I have over 30 years of experience leading multidisciplinary failure analysis and design projects in metallurgical and materials science engineering, corrosion engineering, materials joining and welding, and biomedical engineering for a variety of companies and firms. My qualifications are detailed in my *curriculum vitae*, which is attached hereto as Exhibit A.

3. In 1988, I earned a B.S. in Mechanical Engineering (Metallurgy Option) from the University of Nebraska at Lincoln. In 1990, I received an M.S. in Mechanical Engineering

(Metallurgy Option) from University of Nebraska at Lincoln. In 1993, I earned a Ph.D. in Materials Science Engineering by the University of Nebraska at Lincoln. My doctoral dissertation was entitled "Metallurgical Phase Transformations in the Case Layer of a Carburized Bearing Steel Due to Rolling Contact Fatigue."

4. From 1993 to 1997, I served as a Research Assistant Professor at the Colorado School of Mines, in Golden, Colorado, where I conducted research, taught graduate and undergraduate courses in metallurgical and materials science engineering, supervised and managed graduate and undergraduate student research projects, presented and published technical research results, and conducted failure analysis, engineering design and maintenance metallurgy for several companies and firms.

5. From 1997 to 1998, I worked as a Materials Specialist and Supervisor of the Analytical Services Group at LTV Steel Company, a produce of flat-rolled and coated sheet steels. In that capacity, I supervised personnel and analytical research equipment including a complete metallurgical laboratory, two scanning electron microscopes, FTIR, x-ray diffraction, laser surface profilometer, numerous hardness testers, and corrosion testing. I also evaluated metallurgy quality problems with sheet steel and coatings, conducted mechanical property and fatigue evaluations, performed corrosion testing and failure analysis.

6. From 1998 to 2000, I was a Specialist and Principal Engineer for the Timken Company, an alloy steel and bearing manufacturing company. In those roles, I participated in the microstructural design of debris resistant bearings and heat treatment processing, performed basic static and dynamic mechanical testing on standard test samples and prototype components, managed all metallurgical and heat-treat quality issues, supervised validations and documentation for production derivatives, and recommended potential design options. I was also involved with failure analysis of returned products and issues involving potential product liability litigation.

7. From 2000 to 2005, I was the Global Metallurgy and Materials Leader and Principal Engineer for Zimmer, Inc., a manufacturer of orthopedic, spinal, and dental medical devices. I coordinated materials research efforts between branches of the company, including eliminating research redundancies, resolving systemic manufacturing issues, prioritizing research projects, and developing best practice recommendations. I was the team leader and obtained three patents in developing a process for metallurgically attaching trabecular metal (tantalum foam) to titanium substrates. I was a key member of the project team that responsible for metallurgically attaching trabecular metal coating to new products. I managed the corrosion laboratory, where I performed and directed corrosion tests and analysis including long-term immersion testing and potentiodynamic anodic polarization (PAP) testing. I was also the project manager for the development of a surface carburization heat treatment for austenitic stainless-steel trauma products. Further, I designed test protocols for new product static and dynamic testing, including bending fatigue, uniaxial fatigue, shear, tensile, fracture toughness, coating adhesion, corrosion testing, residual stress, chemical analysis, and microstructural characterization.

8. From 2005 to 2011, I was the NUCOR Professor of Metallurgy at the South Dakota School of Mines and Technology. In that capacity, I taught graduate and undergraduate courses in materials and metallurgical engineering and developed a research program in physical and mechanical metallurgy. From 2010 to 2011, served as the Director of the Biomedical Engineering Graduate Program.

9. Also from 2005 to 2011, I formed Medlin Engineering Services and served as a private engineering consultant, where I conducted forensic engineering investigations, failure analysis, undertook engineering design, and maintenance metallurgical engineering problems for several companies and firms.

10. From 2011 to 2015, I was a senior managing consultant for Engineering Systems, Inc., a consulting engineering and investigation company in Omaha, Nebraska. I conducted forensic engineering investigations, failure analysis, engineering design, and provided expert testimony and maintenance metallurgical engineering problem solving for a number of companies and firms.

11. Also from 2011 to 2015, I served as an adjunct professor at the South Dakota School of Mines and Technology where I provided graduate student guidance and served as a graduate student committee member and an advisor in the Metallurgical Engineering and Biomedical Engineering program.

12. From 2015 to present, I have a been a senior consultant for EAG Laboratories, where I have conducted engineering investigations, failure analysis, engineering design, expert testimony and maintenance metallurgical engineering problem solving, and served as a technical expert in litigation involving failure analysis, materials and metallurgical engineering, biomedical engineering, corrosion engineering, design and safety issues, and manufacturing problems.

13. In 2019, I was named the Kielhorn Professor in the Department of Materials Joining & Welding Engineering at LeTourneau University in Longview, Texas. In that role, I graduate and undergraduate courses in materials and metallurgical engineering, materials and joining welding engineering, as well as developing a research program in welding related metallurgy.

14. I have authored or co-authored more than 40 peer-reviewed papers in materials and metallurgical engineering. I have given more than 100 presentations. I am a Licensed Professional Engineer in Ohio, Nebraska, and Texas. I am a member of the American Society for Materials International; Failure Analysis Society, ASM International; International Metallographic Society; American Society for Testing Materials; The Metallurgical Society; the Professional Engineering Examination Board; the Professional Engineering Examination Review Committee; Society for

Biomaterials; Society for Automotive Engineers; the Iron & Steel Society; and the National Association of Corrosion Engineers. I have been honored as a Fellow of Alpha Sigma Mu, an International Professional Honor Society for Materials Science and Engineering; awarded tenure and professorship at the South Dakota School of Mines & Technology; honored as the NUCOR Professor at the South Dakota School of Mines & Technology; and honored as a fellow of ASM.

15. I am a named inventor on five U.S. patents and two U.S. patent applications. Those patents and patent applications are listed in my C.V., attached hereto as Exhibit A.

16. I have served as an expert witness and testified in a number of litigation matters. A list of cases in which I have testified (in deposition or at trial) in the last four years is attached hereto as Exhibit B. For this engagement, I am being compensated at my standard rate of $450.00 per hour. My compensation is not dependent on the content of my opinions or the outcome of this case.

III. APPLICABLE LEGAL STANDARDS

17. I am not an attorney. For the purposes of this Declaration, I have been informed about certain aspects of the law that are relevant to my opinions. Some of those understandings of the law are summarized below.

18. I understand that claim terms in a patent are generally given their plain and ordinary meaning to one of skill in the art at the time of the claimed invention, when read in the context of the specification and the prosecution history.

19. I understand that the plain and ordinary meaning of a claim term will not control if a patentee sets out a definition and acts as his own lexicographer. I understand that to act as a lexicographer, the patentee must clearly set forth a definition of the claim term.

20. I have been informed and understand that a claim is indefinite under 35 U.S.C. § 112 if it fails to "inform those skilled in the art about the scope of the invention with reasonable

certainty." I understand that in order for a claim to be definite, the claim language must make clear the boundaries of the subject matter encompassed by the claim.

IV. TIME OF INVENTION AND LEVEL OF ORDINARY SKILL IN THE ART

21. It is my understanding that the parties in this case dispute the proper construction of numerous claim terms in U.S. Patent Nos. 9,903,010 ("the '010 Patent") and 10,329,653 ("the '653 Patent"). I have been informed and understand that claim construction is viewed from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the claimed invention.

22. I have been informed that Terves claims priority for the '010 and '653 Patents to April 18, 2014, which is the filing date of U.S. provisional patent application No. 61/981,425. Thus, for purposes of this Declaration, the time of the invention is April 18, 2014.

23. Based on my review of the '010 and '653 Patents, it is my opinion that a POSITA at the time of the invention would be someone with at least a bachelor's degree in metallurgical, materials, or mechanical engineering, or the equivalent, and at least five years of experience in metallurgical and materials engineering, or an equivalent amount of relevant work and/or educational experience.

24. Based on my level of education and experience, I am familiar with the level of knowledge that a POSITA would have possessed at the time of the invention, i.e., April 18, 2014, and by then, I was a POSITA.

V. OPINION ON DISPUTED TERMS

25. I have reviewed the '010 and '653 Patents and the parties' proposed constructions of certain claims terms and have formed opinions with respect to the understanding of the following terms of the '010 and '653 Patents to a POSITA in view of the claim context, specification, and file history:

- intermetallic phase ('010 and '653 Patents);

- melting point temperature of said magnesium or magnesium alloy ('010 Patent);
- smaller average sized particles ('653 Patent);
- greater weight percent of said in situ formed galvanically-active particles ('653 Patent);
- sufficient quantities in said galvanically-active intermetallic phases ('653 Patent); and
- a portion of said additive material forming solid particles … and a portion of said additive material remaining unalloyed additive material ('010 Patent).

26. In summary, it is my opinion that each of these claim terms, read in light of the patent's specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. I explain the basis for this opinion for each claim term below.

A. intermetallic phase

27. The claim term "intermetallic phase" appears in claims 1, 2, 14–20, 28, 29, and 37–42 of the '010 Patent and claims 1, 12, 49, 73, and 74 of the '653 Patent. (The term "intermetallic particle" appears in claims 25, 29, 33, 37, 41, and 45 of the '653 Patent.)

28. I understand that the Ecometal Defendants have proposed that the term "intermetallic phase" be construed to mean a "solid phase involving two or more metallic or semi-metallic elements with an ordered structured and well-defined and fixed stoichiometry."

29. A POSITA would understand that intermetallic phases or compounds have a fixed stoichiometry, which is consistent with Ecometal's proposed construction for this term. Stoichiometry is the relationship between the relative quantities of substances taking part in a reaction or forming a compound, typically expressed as a ratio of whole integers.

30. I understand Terves proposes "intermetallic phase" be construed to mean "compound that has two or more metals." As support, Terves references the definition of "intermetallic compound" provided in *Materials Science and Engineering, An Introduction* (7th

Ed.), 2007, Callister, Jr., William D., which is "A compound of two metals that has a distinct chemical formula. On a phase diagram it appears as an intermediate phase that exists over a very narrow range of compositions."

31. However, as used in the '010 and '653 Patents, the term "intermetallic phase" is undefined because '010 and '653 claims, specifications, and prosecution histories do not define the stoichiometries for the various "intermetallic phases." More specifically, the number of atoms of each element in the intermetallic phase compounds is never defined and, instead, the variable subscript "x" is used in the formulas for the intermetallic phases without any definition or range provided for "x," providing an undefined intermetallic phase, precipitate, or particle, highlighted by the following examples:

- "said additive metal includes nickel, said nickel constitutes about 0.05-35 wt% of said magnesium composite, said nickel forming intermetallic ***Mg_xNi*** as a galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 14, col. 18:65–19:2) (emphasis added);

- "said nickel constitutes about 0.05-35 wt% of said magnesium composite, said nickel forming intermetallic ***Mg_xNi*** as a galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 15, col. 19:32–35) (emphasis added);

- "The method as defined in claim 1**,** wherein said additive includes copper, said copper constitutes about 0.05-35 wt % of said magnesium composite, said copper forms intermetallic ***$CuMg_x$*** as the galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 16) (emphasis added);

- "The method as defined in claim 13**,** wherein said additive includes copper, said copper constitutes about 0.05-35 wt % copper of said magnesium composite, said copper forms intermetallic ***$CuMg_x$*** as the galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 17) (emphasis added);

- "The method as defined in claim 1**,** wherein said additive includes cobalt, said coblat (*sic*) constitutes about 0.05- 35 wt % of said magnesium composite, said cobalt forms intermetallic ***$CoMg_x$*** as the galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 18) (emphasis added);

- "The method as defined in claim 13**,** wherein said additive includes cobalt, said coblat (*sic*) constitutes about 0.05-35 wt % of said magnesium composite, said cobalt forms intermetallic ***$CoMg_x$*** as the galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 19) (emphasis added);

- "said additive metal includes nickel, said nickel constitutes about 0.05-35 wt % of said mixture, said nickel forming intermetallic ***Mg_xNi*** as a galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 28, col. 21:23–27) (emphasis added);

- "said additive metal includes nickel, said nickel constitutes about 0.05-35 wt % of said mixture, said nickel forming intermetallic ***Mg_xNi*** as a galvanically-active in situ precipitate in said magnesium composite" ('010 Patent, claim 29, col. 21:61–65) (emphasis added);

- "In yet another and/or alternative non-limiting aspect of the invention, there is provided a magnesium composite that is over 50 wt % magnesium and cobalt is added to the magnesium or magnesium alloy which forms an intermetallic ***Mg_xCo*** as the galvanically-active particle in situ precipitate" ('010 Patent, col. 5:60–65; '653 Patent, col. 5:60–65) (emphasis added);

- "During the mixing process, solid particles of ***$CoMg_x$*** are formed. Once the mixing process is complete, the mixture of molten magnesium or magnesium alloy, solid particles of ***$CoMg_x$***, and any unalloyed cobalt particles are cooled and an in situ precipitate of solid particles of ***$CoMg_x$*** and any unalloyed cobalt particles are formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 6:3–9; '653 Patent, col. 6:3–9) (emphasis added);

- "Throughout the mixing process, the temperature of the molten magnesium or magnesium alloy is less than the melting point of the secondary metal. During the mixing process, solid particles of ***SM[Secondary Metal]Mg_x*** are formed. Once the mixing process is complete, the mixture of molten magnesium or magnesium alloy, solid particles of ***$SMMg_x$***, and any unalloyed secondary metal particles are cooled and an in situ precipitate of solid particles of ***$SMMg_x$*** and any unalloyed secondary metal particles are formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 6:25–34; '653 Patent, col. 6:25–34) (emphasis added);

- "During the mixing process, solid particles of ***$SMMg_x$*** are formed. Once the mixing process is complete, the mixture of molten magnesium or magnesium alloy, solid particles of ***$SMMg_x$***, and any unalloyed secondary metal particles are cooled and an in situ precipitate of solid particles of ***$SMMg_x$*** and any unalloyed secondary metal particles are formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 6:53–60; '653 Patent, col. 6:53–60) (emphasis added);

- "During the mixing process, solid particles of ***$SMMg_x$*** are formed. Once the mixing process is complete, the mixture of molten magnesium or magnesium alloy, solid particles of ***$SMMg_x$*** and any unalloyed secondary metal particles are cooled and an in situ precipitate of solid particles of ***$SMMg_x$***, and any unalloyed secondary metal particles are formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 7:13–20: '653 Patent, col. 7:13–20) (emphasis added);

- "During the mixing process, solid particles of ***$SMMg_x$*** were formed. Once the mixing process was completed, the mixture of molten magnesium or magnesium alloy, solid particles of ***$SMMg_x$***, and any unalloyed secondary metal particles are cooled and an in situ precipitate of solid particles of ***$SMMg_x$*** and any unalloyed secondary metal particles are

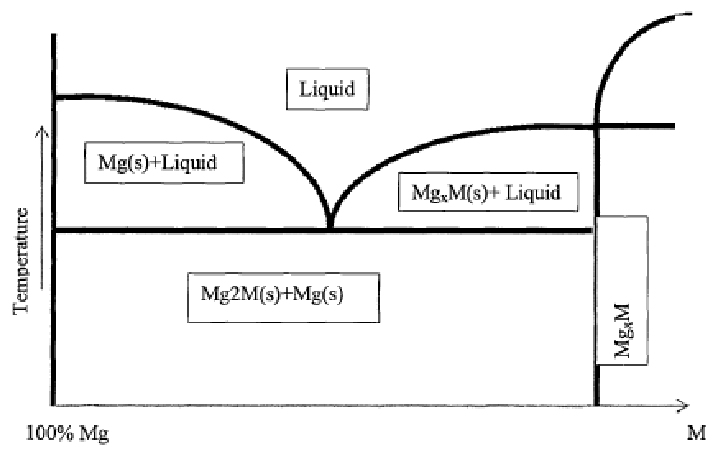
formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 7:39–46; '653 Patent, col. 7:39–46) (emphasis added);

- "During the mixing process, solid particles of ***$SMMg_x$*** are formed. Once the mixing process is complete, the mixture of molten magnesium or magnesium alloy, solid particles of ***$SMMg_x$***, and any unalloyed secondary metal particles are cooled and an in situ precipitate of solid particles of ***$SMMg_x$*** and any unalloyed secondary metal particles are formed in the solid magnesium or magnesium alloy" ('010 Patent, col. 7:65–8:6; '653 Patent, col. 7:66–8:6).

- "The galvanically-active particle can be ***$SMMg_x$, $SMAl_x$, $SMZn_x$, $SMZr_x$, $SMMn_x$, SMB_xSMBi_x***, SM in combination with any one of B, Bi, Mg, Al, Zn, Zr, and Mn" ('010 Patent, col. 8:30–33; '653 Patent, col. 8:30–33) (emphasis added);

- "The galvanically-active particle can be ***$SMMg_x$, $SMZn_x$, $SMZr_x$, $SMMn_x$, SMB_x, $SMBi_x$, SM*** in combination with any one of Mg, Zn, Zr, Mn, B and/or Bi." ('010 Patent, col. 8:48–50: '653 Patent, col. 8:48–50) (emphasis added); and

- Figure 4 of the '010 and '653 Patents:



32. A POSITA would therefore have no reasonable basis for determining the respective stoichiometries of the "intermetallic phases" claimed by the '010 and '653 Patents.

33. In addition to the undefined stoichiometries of the so-called "intermetallic phases," the claims, specification, and prosecution histories of the '010 and '653 Patents are also unclear as to whether the "galvanically-active intermetallic particle" is formed by reactions between the magnesium and a secondary metal, an alloy and a secondary metal, or the magnesium alloy and the secondary metal.

34. For example, claim 25 of the ’653 Patent states:

> “A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising at least 85 wt. % magnesium; one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt.% zinc, 0.01-3 wt.% zirconium, and 0.15-2 wt. % manganese; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite, said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron, said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2 /hr. in 3 wt. % KCI water mixture at 90° C.

35. The specification does not provide any guidance as to whether the “galvanically-active intermetallic particle” is formed by reactions between the magnesium and a secondary metal, an alloy and a secondary metal, or the magnesium alloy and the secondary metal:

- “The galvanically-active particle can be ***$SMMg_x$, $SMAl_x$, $SMZn_x$, $SMZr_x$, $SMMn_x$, SMB_xSMBi_x***, SM in combination with any one of B, Bi, Mg, Al, Zn, Zr, and Mn” (’010 Patent, col. 8:30–33; ’653 Patent, col. 8:30–33) (emphasis added); and

- “The galvanically-active particle can be ***$SMMg_x$, $SMZn_x$, $SMZr_x$, $SMMn_x$, SMB_x, $SMBi_x$, SM*** in combination with any one of Mg, Zn, Zr, Mn, B and/or Bi.” (’010 Patent, col. 8:48–50: ’653 Patent, col. 8:48–50) (emphasis added).

36. A POSITA would understand this vagueness raises the possibility of the formation of tertiary compounds, which the claims, specifications, and prosecution histories do not disclose.

37. It is therefore my opinion because the stoichiometries of the so-called “intermetallic phases” are undefined and/or it is unclear whether the “galvanically-active intermetallic particle” is formed by reactions between the magnesium and a secondary metal, an alloy and a secondary metal, or the magnesium alloy and the secondary metal that claims 1, 2, 14–20, 28, 29, and 37–42 of the ’010 Patent and claims 1, 12, 49, 73, and 74 of the ’653 Patent would fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention on April 18, 2014.

B. melting [point] temperature of said magnesium or magnesium alloy

38. The claim term “melting [point] point temperature of said magnesium or magnesium alloy” appears in claims 1, 10, 11, 15, 20, 24, 25, 28, 29, and 37–42 of the ’010 Patent and claims 12 and 69 of the ’653 Patent.

39. I understand that the Ecometal Defendants propose construing the term “melting [point] temperature of said magnesium or magnesium alloy” to mean “melting point of the magnesium or magnesium alloy with zero additive material, and not a point on the liquidus or solidus curves for magnesium or magnesium alloy with an additive.”

40. I also understand that Terves’s position is that term “melting [point] temperature of said magnesium or magnesium alloy” does not require construction or, alternatively, to mean “temperature at which liquid is formed.”

41. A POSITA would understand that the melting point of pure magnesium would be well-established. However, the melting point of a magnesium alloy is a continuously changing curve depending on the type (*e.g.*, aluminum, zinc, iron, titanium, etc.) and amount of alloy added to the magnesium.

42. Additionally, there exist a sequence of alloys for which defining the respective melting points is impossible.

43. There is also a difference in what a POSITA would consider to be “melting” with regards to an alloy. For example, when heating an alloy, the alloy material begins to melt at a temperature called the “solidus.” Then, at the temperature above the “liquidus,” the alloy material is completely liquid. Where the solidus and liquidus do not coincide, the temperature zone between the solidus and the liquidus—what a POSITA would refer to as the solidus–liquidus range, or, less formally, as the “slush zone”—includes solid and liquid phases of the alloy material simultaneously.

44. Terves's proposed construction of "temperature at which liquid is formed" would include the solidus temperature and the "slush zone." However, the '010 and '653 claims, specifications, and prosecution histories do not define what that temperature range including the solidus and slush zone might be. Instead, the '010 and '653 patents refer to a melting "point" temperature, which, as stated above, is not a point that would be readily understood by a POSITA with regards to an alloy.

45. A POSITA would have commonly understood on April 18, 2014 the melting temperature to be the temperature where 100% of the alloy material is liquid, i.e., the liquidus temperature.

46. The claims, specification, and prosecution history do not provide a standard for ascertaining the requisite degree. As such, a POSITA would not be apprised of the scope of the invention of claims 1, 10, 11, 15, 20, 24, 25, 28, 29, and 37–42 of the '010 Patent and claims 12 and 69 of the '653 Patent.

C. smaller average sized particles [of said in situ formed galvanically-active particles]

47. The claim term "smaller average sized particles [of said in situ formed galvanically-active particles]" appears in claim 10 of the '653 Patent.

48. The term "smaller average sized particles [of said in situ formed galvanically-active particles]" has no particular meaning to a POSITA without proper context. Specifically, a POSITA would not know the average size of a particle of in situ formed galvanically-active particles, and would therefore not know what constitutes a smaller average sized particle of in situ formed galvanically-active particles.

49. The claim language, the context of the term in the claim language, the specification, and the prosecution history do not provide sufficient information from which a POSITA could

infer the meaning of this term, i.e., the smaller average sized particles of in situ formed galvanically-active particles.

50. The claims and specifications of the ’010 and ’653 Patents disclose the average particle diameter size of the one or more additive materials, but does not disclose the average particle diameter size of the in situ formed galvanically active particles. For example:

- “The method as defined in claim 1, wherein ***said additive*** is formed of a single composition, and ***have an average particle diameter size of about 0.1–500 microns.***” (’010 Patent, Claim 5) (emphasis added);

- “The method as defined in claim 4, wherein ***said additive*** is formed of a single composition, and ***have an average particle diameter size of about 0.1–500 microns***.” (’010 Patent, Claim 6) (emphasis added);

- “said additive metal includes nickel, said nickel constitutes about 0.05-35 wt% of said magnesium composite, said nickel forming intermetallic Mg_xNi as a galvanically-active in situ precipitate in said magnesium composite, ***said additive having an average particle diameter size of about 0.1-500 microns***;” (’010 Patent, Claim 15, col. 19:33–38) (emphasis added);

- “said additive material having a melting point temperature that is greater than 100° C. than a melting temperature of said magnesium or magnesium alloy, ***an average particle diameter size of said additive material is at least 0.1 micron and up to about 500 microns***, said additive material constituting about 0.05 wt %-45 wt % of said mixture, said additive including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, and iron;” (’010 Patent, Claim 20, col. 20:4–19) (emphasis added);

- “said additive material having a melting point temperature that is 15 greater than 100° C. than a melting temperature of said magnesium or magnesium alloy, ***an average particle diameter size of said additive material is at least 0.1 micron and up to about 500 microns***, said additive material constituting about 0.05 wt %-45 wt % of said mixture , said additive including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, silicon, and iron, said additive metal includes nickel, said nickel constitutes about 0.05-35 wt % of said mixture, said nickel forming intermetallic Mg_xNi as a galvanically-active in situ precipitate in said magnesium composite;” (’010 Patent, Claim 28, col. 21:14–27) (emphasis added);

- “said additive material having a melting point temperature that is greater than 100° C. than a melting temperature of said magnesium or magnesium alloy, ***an average particle diameter size of said additive material is at least 0.1 micron and up to about 500 microns***, said additive material constituting about 0.05 wt %-45 wt % of said mixture , said additive including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, silicon, and iron, said additive metal includes nickel, said nickel constitutes about 0.05-35 wt % of said mixture, said nickel forming intermetallic Mg_xNi as a galvanically-

active in situ precipitate in said magnesium composite;" ('010 Patent, Claim 29, col. 21:52–65) (emphasis added);

- "The magnesium composite as defined in [independent] claim 49, wherein ***said additive material includes particles having an average particle diameter size of about 0.1–500 microns***." ('653 Patent, Claim 51) (emphasis added); and

- "The one or more additives generally have an average particle diameter size of at least about 0.1 microns, typically no more than about 500 microns (e.g., 0.1 microns, 0.1001 microns, 0.1002 microns ... 499.9998 microns, 499.9999 microns, 500 45 microns) and including any value or range therebetween, more typically about 0.1 to 400 microns, and still more typically about 10 to 50 microns." ('010 Patent, col. 2:40–47; '653 Patent, col. 2:42–49).

51. The claims, specification, and prosecution history therefore do not provide a standard for ascertaining the requisite degree of "smaller average sized particles [of said in situ formed galvanically-active particles]". As such, a POSITA would not be apprised of the scope of the invention of claim 10.

52. It is therefore my opinion that claim 10 of the '653 Patent fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

D. greater weight percent of said in situ formed galvanically-active particles

53. The claim term "greater weight percent of said in situ formed galvanically-active particles" appears in claim 10 of the '653 Patent.

54. The term "greater weight percent of said in situ galvanically-active particles" has no particular meaning to a POSITA without proper context. Specifically, a POSITA would not know the weight percent of the in situ formed galvanically-active particles, and would therefore not know what constitutes a greater weight percent of the claimed in situ formed galvanically-active particles.

55. The claim language, the context of the term in the claim language, the specification, and the prosecution history do not provide sufficient information from which a POSITA could

infer the meaning of this term, i.e., the greater weight percent of said in situ formed galvanically-active particles.

56. The claims and specifications of the ’010 and ’653 Patents disclose the relative weight of the one or more additives, as compared to the magnesium or magnesium alloy, but does not disclose the relative weight of the in situ formed galvanically active particles. For example:

- “The ***one or more additives*** typically are added in a ***weight percent that is less*** than a weight percent of said magnesium or magnesium alloy. Typically, the magnesium or magnesium alloy constitutes about 50.1 wt %-99.9 wt % of the magnesium composite and all values and ranges there between. In one non-limiting aspect of the invention, the magnesium or magnesium alloy constitutes about 60 wt. %-95 wt % of the magnesium composite, and typically the magnesium or magnesium alloy constitutes about 70 wt %-90 wt % of the magnesium composite” (’653 Patent, col. 2:30–39) (emphasis added).

57. Further, the ’010 and ’653 Patent disclose ***how*** and ***for what purpose*** a greater weight percent of the in situ formed galvanically-active parties can be achieved, but it does not provide what that greater weight percent should be or even a reference weight percent. For example:

- “Because galvanic corrosion is driven by both the electro potential between the anode and cathode phase, as well as the exposed surface area of the two phases, the rate of corrosion can also be controlled through adjustment of the in situ formed particles size, while not increasing or decreasing the volume or weight fraction of the addition, and/or by changing the volume/weight fraction without changing the particle size. Achievement of in situ particle size control can be achieved by mechanical agitation of the melt, ultrasonic processing of the melt, controlling cooling rates, and/or by performing heat treatments. In situ particle size can also or alternatively be modified by secondary processing such as rolling, forging, extrusion and/or other deformation techniques” (’653 Patent, col. 3:45–58); and

- “An increase in the weight percent of the in situ formed particles or phases in the magnesium composite can also or alternatively be used to increase the dissolution rate of the magnesium composite. A phase diagram for forming in situ formed particles or phases in the magnesium composite is illustrated in FIG. 4” (’653 Patent, col. 16:55–61).

58. Fig. 4 of the ’653 Patent (reproduced in ¶ 31) does not provide a weight percent of the in situ formed galvanically-active parties, let alone a greater weight percent.

59. The claims, specification, and prosecution history therefore do not provide a standard for ascertaining the requisite degree of "greater weight percent of said in situ formed galvanically-active particles." As such, a POSITA would not be apprised of the scope of the invention of claim 10.

60. It is therefore my opinion that claim 10 of the '653 Patent fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

E. [said additive material located in] sufficient quantities in said galvanically-active intermetallic phases

61. The claim term "sufficient quantities in said galvanically-active intermetallic phases" appears in claims 49 and 73 of the '653 Patent.

62. The term "[said additive material located in] sufficient quantities in said galvanically-active intermetallic phases" has no particular meaning to a POSITA without proper context. Specifically, without proper context, a POSITA would not know any quantity of the additive materials in said galvanically-active intermetallic phases, and would therefore not know what constitutes sufficient quantities of the additive material in galvanically-active intermetallic phases.

63. The claim language, the context of the term in the claim language, the specification, and the prosecution history do not provide sufficient information from which a POSITA could infer the meaning of this term, i.e., [said additive material located in] sufficient quantities in said galvanically-active intermetallic phases.

64. The claims and specifications of the '010 and '653 Patents disclose that the additives can be used in "quantities" so that galvanically-active intermetallic or insoluble precipitates form in the magnesium or magnesium alloy, but do not disclose the precise quantities, let alone what would constitute "sufficient" quantities. For example:

- “The one or more additives can be selected and used in quantities so that galvanically-active intermetallic or insoluble precipitates form in the magnesium or magnesium alloy while the magnesium or magnesium alloy is in a molten state and/or during the cooling of the melt; however, this is not required” (’653 Patent, col. 2:24–29; and ’653 Patent, col. 15:66–16:4).

65. The claims, specification, and prosecution history therefore do not provide a standard for ascertaining the requisite degree of “[said additive material located in] sufficient quantities in said galvanically-active intermetallic phases.” As such, a POSITA would not be apprised of the scope of the invention of claims 49 and 73 of the ’653 Patent.

66. It is therefore my opinion that claims 49 and 73 of the ’653 Patent fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

F. a portion of said additive material forming solid particles … and a portion of said additive material remaining unalloyed additive material

67. The claim term “a portion of said additive material forming solid particles … and a portion of said additive material remaining unalloyed additive material” appears in claims 20, 28, 29, and 37–42 of the ’010 Patent and claims 12 and 71 of the ’653 Patent.

68. The terms “a portion of said additive material forming solid particles … and a portion of said additive material remaining unalloyed additive material” has no particular meaning to a POSITA without proper context. Specifically, without proper context, a POSITA would not know any portions of the additive materials, let alone those that form solid particles and those that remain unalloyed additive material.

69. The claim language, the context of the term in the claim language, the specification, and the prosecution history do not provide sufficient information from which a POSITA could infer the meaning of this term, i.e. a portion of said additive material forming solid particles … and a portion of said additive material remaining unalloyed additive material.

70. The claims, specification, and prosecution history therefore do not provide a standard for ascertaining the requisite degree of “a portion of said additive material forming solid

particles … and a portion of said additive material remaining unalloyed additive material." As such, a POSITA would not be apprised of the scope of the invention of claims 20, 28, 29, and 37–42 of the '010 Patent and claims 12 and 71 of the '653 Patent.

71. It is therefore my opinion that claims 20, 28, 29, and 37–42 of the '010 Patent and claims 12 and 71 of the '653 Patent fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

VI. CONCLUSION

72. In signing this Declaration, I recognize that it will possibly be submitted as evidence or an exhibit in a contested case before the U.S. District Court in the Northern District of Ohio. I also recognize that I may be called upon to testify in deposition or before the Court. If called upon to testify, I would testify truthfully and competently to all matters stated in this Declaration.

73. I reserve the right to supplement my opinions in the future to respond to any arguments that Terves raises and to take into account new information as it becomes available to me.

74. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Dated: April 10, 2020

By: Dana J. Medlin

Dana J. Medlin, Ph.D.

EXHIBIT A

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Education

Ph.D. Materials Science Engineering, University of Nebraska - Lincoln, NE
M.S. Mechanical Engineering (Metallurgy Option), University of Nebraska - Lincoln, NE
B.S. Mechanical Engineering (Metallurgy Option), University of Nebraska - Lincoln, NE

Licensed Professional Engineer (P.E.)

- **Ohio** (E63399)
- **Nebraska** (E-15403)
- **Texas** (137618)

Overview

Dr. Medlin has over 30 years of experience leading multidisciplinary failure analysis and design projects in metallurgical and materials science engineering, corrosion engineering, materials joining and welding, and biomedical engineering for a variety of companies and firms. He has testified internationally as an expert witness in cases involving medical device, automotive, aerospace, heavy equipment, fire investigations, firearms, ammunitions, and marine applications. Specific areas of experience include: Failure Analysis & Remedial Action, Applied Research & Development, Medical Device Design and Validation, Bearing and Gear Investigations, Welding Metallurgy, Corrosion Evaluations and Testing, Mechanical Testing, Heat Treatment Issues, Metallurgical Related Fire Investigations, and Lectures on many Metallurgical and Biomaterials Engineering Topics. Dr. Medlin is a Fellow of ASM-International, a distinguished honor in the field of metallurgical and materials science engineering. He is also a Technical Advisor Member of the Association of Firearm and Tool Mark Examiners (AFTE) and the Kielhorn Professor of Materials Joining & Welding Engineering at LeTourneau University.

Experience

2015 – Present .... Senior Consultant
EAG Laboratories
El Segundo, CA and Longview, TX
- Conducts forensic engineering investigations, failure analysis, engineering design, expert testimony and maintenance metallurgical engineering problem solving. Dr. Medlin has been a technical expert in national and international litigation involving failure analysis, materials and metallurgical engineering, biomedical engineering, corrosion engineering, design and safety issues, and manufacturing problems. He has also been involved with research and development projects for numerous corporations.

2019 – Present .... Kielhorn Professor
Department of Materials Joining & Welding Engineering
LeTourneau University
Longview, TX
- Responsible for teaching undergraduate and graduate courses in materials & metallurgical engineering, materials joining & welding engineering, as well as developing a research program in

welding related metallurgy, undergraduate and graduate student advisor, student recruitment, regional consultant for industry, etc.

2011 – 2015 .... **Senior Managing Consultant**
Engineering Systems Inc. (A consulting engineering & investigation company)
Omaha, NE
- Conducted forensic engineering investigations, failure analysis, engineering design, expert testimony and maintenance metallurgical engineering problem solving for a variety of companies and firms.

2011 – 2015 .... **Adjunct Professor**
South Dakota School of Mines and Technology
Department of Materials and Metallurgical Engineering
Biomedical Engineering Graduate Program
Rapid City, SD
- Graduate student guidance, graduate student committee member, Metallurgical Engineering and Biomedical Engineering program advisor, and research project consultant.

2005 – 2011 .... **NUCOR Professor of Metallurgy**
South Dakota School of Mines and Technology
Rapid City, SD

- **Department of Materials and Metallurgical Engineering** (2005 – 2011)
  Responsible for teaching undergraduate and graduate courses in materials and metallurgical engineering, developing a research program in physical and mechanical metallurgy, undergraduate and graduate student advisor, student recruitment, regional consultant for industry, etc. Thesis Advisor for 12 graduate students and served on 25 thesis committees. Research involved with the Arbegast Materials Processing & Joining Laboratory, Center for Friction Stir Processing and Corrosion Engineering Research. Awarded Tenure April 2011.
- **Director of the Biomedical Engineering Graduate Program** (2010 - 2011)
  Responsible for managing the Biomedical Engineering graduate program at SDSM&T, managing graduate students, teaching courses, directing research projects, managing budgets, and coordinating research and teaching efforts with the University of South Dakota. Advisor for 5 graduate students in Biomaterials projects.

2005 – 2011 .... **Private Engineering Consultant**
Medlin Engineering Services
- Conducted forensic engineering investigations, failure analysis, engineering design, and maintenance metallurgical engineering problems for several companies and firms.

2000 – 2005 .... **Global Metallurgy & Materials Leader and Principal Engineer**
Zimmer, Inc. (A major manufacturer of orthopedic, spinal and dental medical devices)
Metals Research Group
Warsaw, IN
- Coordinated materials research efforts between the different research organizations: Spinal - Minneapolis MN, Dental-Carlsbad CA, Orthopedic Europe – Switzerland, and Orthopedic US – Warsaw IN. Led efforts to eliminate research redundancies, reduce research outsourcing, unify corporate specifications and test procedures, resolve systemic manufacturing issues, prioritize research projects, develop "best practice" recommendations, etc.
- Team leader in the process development of metallurgically attaching Trabecular Metal (tantalum foam) to titanium substrates (three U.S. patents). Key member of project team responsible for metallurgically attaching the Trabecular Metal coating to new products including: modular acetabular cup, modular hip stem, and minimal invasive surgical hip stem. Instrumental in process validations

and solving several production rollout problems. Modular acetabular cup project went from concept to full production.
- Managed the Corrosion Laboratory and doubled the testing capability in two years. Performed and directed corrosion tests and analysis including long-term immersion testing and potentiodynamic anodic polarization (PAP) testing. Designed corrosion test protocols for several new products.
- Project manager with the development of surface carburization heat treatment for austenitic stainless steel trauma products (plates and screws) and Co/Cr/Mo metal-on-metal hip and knee components. This process showed a 35% performance improvement and development work is being applied toward production components.
- Designed test protocols for new product static and dynamic mechanical testing including: bending fatigue, uniaxial fatigue, shear, tensile, fracture toughness, coating adhesion, corrosion testing, residual stress, chemical analysis, microstructural characterization, etc.
- Managed three projects evaluating new implant material evaluations and new process evaluations. Two of the new implant materials are being considered for future product application.
- Experience with Food and Drug Administration (FDA) medical implant regulations, 510k submissions, IDEs, testing requirements, process validations, test protocols, etc.
- Performed failure analysis on implants and reported failure source and possible corrective actions.
- Heat treat furnace and process equipment procurement and validation.
- Continuous involvement with solving production problems such as: machine tool and tool coating problems, laser welding problems, TIG welding issues, surface quality issues, machining scrap issues, casting defects, electro polishing problems, NDT issues, and heat treat issues.

1998 – 2000 .... Specialist and Principle Engineer

The Timken Company (An alloy steel and bearing manufacturing company)
Bearing Metallurgy and Materials Department
Canton, OH
- Promoted to Specialist May 2000.
- Aerospace Division Plant Metallurgist February 2000 to April 2000. Managed 3 engineers and 6 technicians. Managed all metallurgical and heat treat quality issues. Supervised furnace validations and documentation for production deviations. Interfaced with customer design engineers concerning new product designs and made recommendations of potential design options.
- Principal Engineer September 1998 to May 2000.
- Instrumental in the microstructural design of “Debris Resistant Bearings” and the heat treatment processing. Interfaced with the customer to optimize the static and dynamic properties for this particular application. Team leader in resolving heat treatment and carburizing problems during initial rollout into production. This project went from concept to production rollout.
- Performed basic static and dynamic mechanical testing on standard test samples and prototype components.
- Involved with testing, evaluating, and reporting several production cost reduction and improvement projects including: machining tools and machining tool coatings, machining coolants-rates-surface quality, optimizing heat treatment times and temperatures, and induction hardening processes.
- One of two corporate experts with x-ray diffraction for phase identification, residual stress, and texture measurements. Procured and validated a new state-of-the-art XRD system.

1997 – 1998 .... Materials Specialist and Supervisor of Analytical Services Group

LTV Steel Company (Producer of flat rolled and coated sheet steels)
- Supervised the personnel (2 engineers and 5 technicians) and analytical research equipment at the Customer Technical Center. Analytical equipment included: complete metallography laboratory, 2 scanning electron microscopes, FTIR, x-ray diffraction, laser surface profilometer, numerous hardness testers, and corrosion testing.
- Evaluated metallurgy quality problems with sheet steel and coatings, mechanical property and fatigue evaluations, corrosion testing, electrochemical plating and coatings, performed failure analysis and managed research and development projects.

- Wrote technical reports and communicated with customers about product defects, failures, and complaints.
- Assisted customer product development projects with potential new sheet steel design options with several companies including Ford, GM, Chrysler, Maytag, GCC, etc.
- Team Leader to determine methods to improved sheet steel quality by detecting and resolving inconsistent heating/cooling in the rolling mill process.
- Procured and validated glow discharge spectrometer for the laboratory. Led efforts to change carrier gas to Argon. This was the first LECO-GDS system to successfully do this.

1993 – 1997 .... Research Assistant Professor
Colorado School of Mines
Golden, CO
- Managed 6-10 graduate student projects. Graduate student and academic thesis advisor.
- Performed research projects for Chrysler Motors, GM Powertrain, Ford Research, Caterpillar, Timken Company, Torrington, and American Axle.
- Conducted research and supervised graduate and undergraduate research in the ASPPRC.
- Presented and published technical research results.
- Wrote and submitted research grant proposals.
- Performed static and dynamic mechanical testing and managed the fatigue laboratory.
- Taught undergraduate/graduate metallurgical and materials science engineering courses. Also taught short courses on metallurgical engineering to industry.
- Conducted failure analysis, engineering design and maintenance metallurgy for several companies and firms.

1988 – 1993 .... Graduate Research & Teaching Assistant
University of Nebraska-Lincoln
Lincoln, NE
- Assisted with M.S., Ph.D. degrees and consulting on research projects.
- Advisor: Dr. W.N. Weins.

1987 - 1988 .... Undergraduate Research Assistant
University of Nebraska, Lincoln, NE
- NACE undergraduate research grant, corrosion and hydrogen permeation studies.
- Advisor: Dr. D. L. Johnson.

1986 (Summer) .... Engineering Associate
Kawasaki Motors Inc.

Publications/ Presentations

- D.J. Medlin and J. Fuerst, *Failure Analysis of a SCUBA Tank,* Materials Science & Technology Conference 2018, Portland, OR, October 1, 2019.
- D.J. Medlin, *Corrosion and Rupture of a Municipal Water Piping System*, Materials Science & Technology Conference 2018, Portland, OR, October 1, 2019.
- D.J. Medlin, *Failure Analysis of Fracture Fixation Devices for Medical Implant Applications*, Materials Science & Technology Conference 2018, Columbus, OH, October 17, 2018.
- D.J. Medlin and D.L. Johnson, *Corrosion of 304 Stainless Steel Pneumatic Pressure Tube*s, Materials Science & Technology Conference 2018, Columbus, OH, October 17, 2018.
- D.J. Medlin, *Failure Analysis of Artifacts for Litigation*, National Association of Corrosion Engineers Central Area Conference, August 8, 2018.
- D.J. Medlin and D.L. Johnson, *USS Arizona Preservation Project: Corrosion Modeling with Applications*, National Association of Corrosion Engineers, Central Area Conference, August 7, 2018.
- D.J. Medlin, “STEELS: Processing, Structure and Performance”, 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, July 23 – 25, 2018.

- D.J. Medlin, F. Schmidt, *Metallurgy for the Non-Metallurgist*, Association of Firearm and Tool Mark Examiners, Charleston, WV, 8-hour Seminar, June 3, 2018.
- D.L. Johnson, R. De Angelis, D.J. Medlin, J. E. Johnson, J. C. Carr, D. L. Conlin, *The Secant Rate of Corrosion: Correlating Observations of the USS Arizona Submerged in Pearl Harbor*, Journal of Metals, Vol 70, Issue 5, May 2018, pp 747-752.
- D.J. Medlin, *Failure Analysis of Corrosion Artifacts for Litigation*, 48th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 16, 2018.
- D.J. Medlin*, Microbiological Influenced Corrosion of Engineering Components*, 46th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 17, 2018.
- D.J. Medlin and J. D. Fuerst, *Metallographic Preparation and Microstructural Characterization of Additive Manufactured Tantalum and Titanium Alloy Porous Coatings for Biomedical Applications*, ASTM Symposium Commemorating 100 Years of E04 Development of Metallographic Standards, ASTM E04 Committee, Atlanta, GA, November 16, 2017.
- D.J. Medlin, "STEELS: Processing, Structure and Performance", 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, July 31 – August 2 2017.
- D.J. Medlin, "Professional Engineering Examination Review Course for Metallurgical Engineering", The Metallurgical Society, Professional Engineering Examination Committee, Warrendale, PA, 4-hour course, August 18, 2017.
- D.J. Medlin, "Metallurgy for the Non-Metallurgist", Association of Firearm and Tool Mark Examiners, Annual 2017 Meeting, Denver, CO, 8-hour Seminar, May 19, 2017.
- D.J. Medlin, "STEELS: Processing, Structure and Performance", 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, April 10-12, 2017.
- D.J. Medlin, "The Basics of Corrosion", 47th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 17, 2017.
- D.J. Medlin, "The Corrosion of Medical Devices", 47th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 18, 2017.
- D.J. Medlin, "Professional Engineering Examination Review Course for Metallurgical Engineering", The Metallurgical Society, Professional Engineering Examination Committee, Warrendale, PA, 4-hour course, August 27, 2016.
- D.J. Medlin, "STEELS: Processing, Structure and Performance", 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, August 8-10, 2016.
- D.J. Medlin, "Metallurgy for the Non-Metallurgist", Association of Firearm and Tool Mark Examiners, New Orleans, LA, 8-hour Seminar, June 3, 2016.
- D.J. Medlin, "STEELS: Processing, Structure and Performance", 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, May 23-25, 2016.
- D.J. Medlin, "Failure Analysis of Pipelines and Other Components", 46th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 19, 2016.
- D.J. Medlin, Microbiological Influenced Corrosion of Engineering Components", 46th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 19, 2016.
- D.J. Medlin and J. D. Fuerst, "Corrosion of a Nickel-Free Austenitic Stainless Steel Alloy Spinal Implant", Materials Science & Technology 2015, October 8, 2015, Columbus, OH.
- D.J. Medlin and J.D. Fuerst, "Failure of a Cast CoCr Canine Hip Implant", Materials Science & Technology 2015, October 7, 2015, Columbus, OH.
- J.D. Fuerst, S. Sanders, C. Bigelow, and D.J. Medlin, "Unique Conditions of Microbial Influenced Corrosion", Materials Science & Technology 2015, October 5, 2015, Columbus, OH.
- D.J. Medlin, "Professional Engineering Examination Review Course for Metallurgical Engineering", The Metallurgical Society, Professional Engineering Examination Committee, Warrendale, PA, 4-hour course, August 20-21, 2015.
- D.J. Medlin, "Metallurgy for the Non-Metallurgist", Association of Firearm and Tool Mark Examiners, Dallas, TX, 8-hour seminar, May 28, 2015.
- J. Fuerst, D. Medlin, M. Carter, J. Sears, G. Vander Voort, "LASER Additive Manufacturing of Titanium-Tantalum Alloy Structured Interfaces for Modular Orthopedic Devices." *Journal of Metals*, Vol. 67, No.4, April 2015, p.775-780
- D.J. Medlin, "Failure Analysis of Pipelines and Other Components", 45th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 14, 2015.
- D.J. Medlin, "Microbiological Influenced Corrosion", 45th Northern Plains Corrosion Control Course,

National Association of Corrosion Engineers, Omaha, NE, January 13, 2015.
- J. Fuerst, D.J. Medlin, and J. Sears, “Laser Powder Deposition of ALMGB14-T1B2 Wear Resistant Coatings for Biomedical Applications”, Materials Science and Technology 2014 Symposium on Boron Compounds and Nanomaterials, Pittsburg, PA, October 15, 2014.
- J. Fuerst and D.J. Medlin, “Evaluation of the Failure of Two Grade IV CP Titanium Spinal Fusion Rods.” Materials Science and Technology 2014 Symposium on Failure Analysis and Prevention, Pittsburg, PA, October 14, 2014.
- J. Fuerst and D.J. Medlin, “Tibial Non-Union as a Cause for Fracture Fixation Screw Failure”, Materials Science and Technology 2014 Symposium on Failure Analysis and Prevention, Pittsburg, PA, October 14, 2014.
- M. West, J. Kellar, G. Crawford, W. Cross, D. Medlin, “Using Blacksmithing as the Foundation of Curricular, Research, and Outreach Activities”, 2015 TMS Annual Meeting & Exposition, March 18, 2015, Orlando, FL.
- D.J. Medlin, “Failure Analysis of Pipelines and Other Structures.” 44th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 15, 2014.
- D.J. Medlin, “Metallurgy for Beginners.” 44th Northern Plains Corrosion Control Course, National Association of Corrosion Engineers, Omaha, NE, January 15, 2014.
- D.L. Johnson, R.J. DeAngelis, D.J. Medlin, J.D. Carr, D.L. Conlin, “Advances in Chemical and Structural Characterization on Concretion with Implications for Modeling Marine Corrosion.” *Journal of Metals*, Springer Link, May 2014, Vol 66, Issue 5, pp 817-822.
- D.J. Medlin, J.D. Carr, D.L. Johnson, D.L. Conlin, “Metallurgical and Corrosion Assessment of Submerged Tanker S.S. Montebello”, *Materials Performance*, NACE International, Vol. 53, No.1, January 2014, p.74-78.
- D.J. Medlin, “Failure Analysis and Product Development of Medical Devices”, Failure Analysis Symposium, The Microscopy and Surface Analysis Chapter, Medtronic, Minneapolis, MN, December 10, 2013.
- Donald L. Johnson, D.J. Medlin, James D. Carr, Robert J. DeAngelis, David L. Conlin, “Review of USS Arizona Corrosion with Modeling Applications at Diverse Marine Sites”, Conference Proceedings of Department of Defense Virtual Corrosion Conference, September 16-17, 2013, Chapter 3A, Paper #2, www.corrdefense.org/External/ReferenceLibrary
- D.J. Medlin, D. Johnson, J.D. Carr, R. DeAngelis, D.L. Conlin, “New Assessment Methodology for Long Term Corrosion Rate Trajectory Applied to Shipwrecks, Munitions and Offshore Structures.” NACE- Risk Management of Corrodible Systems, June 19, 2013. Washington D.C.
- D.J. Medlin, “Pipeline Failure Analysis and Investigation”, 2013 South Dakota/North Dakota/Wyoming Pipeline Safety Operator Training Course, South Dakota Public Utilities Commission, Rapid City, SD, April 04, 2013
- D. Medlin, “Failure Analysis for Beginners.” Forty-Third Northern Plains Corrosion Control Course, Omaha, NE, January 16, 2013.
- D. Medlin, “Metallurgy for Beginners.” Forty-Third Northern Plains Corrosion Control Course, Omaha, NE, January 15, 2013.
- D. Medlin, “Component Failure Analysis.” Underground Storage Tank Course, State of Iowa Department of Resources, Des Moines, IA, November 8, 2012.
- D.L. Johnson, D. Conlin, L. Murphy, J. Carr, D. Medlin, Montebello Assessment Report, ESI File No.: 37081M, Submission to Office of Marine Sanctuaries, NOAA, Silver Spring, MD, June 14, 2012.
- D. Medlin, “Corrosion of Pipelines and Other Underground Structures.” Nebraska Pipeline Seminar, Grand Island, NE, April 4, 2012.
- D. Medlin, “Failure Analysis of Medical Implants”, American Society of Mechanical Engineers, Continuing Engineering Education Course, Omaha, NE, April 3, 2012.
- J. Fuerst, J. Sears, D. Medlin, K. Kennedy. The Minerals, Metals & Materials Society (TMS) 141st Annual Meeting & Exhibition, Randall M. German Honorary Symposium on Sintering and Powder-Based Materials, “LASER Powder Deposition of AlMgB14-TiB2 Ultra-Hard Coatings on Titanium, Steel, and Cast Iron Substrates,” Orlando, FL, March 11-15, 2012.
- J. Fuerst, J. Sears, D. Medlin, K. Kennedy, The Minerals, Metals & Materials Society (TMS) 141st Annual Meeting & Exhibition, Biological Materials Science Symposium “LASER Powder Deposition of Titanium - Tantalum Alloys Surfaces for Use in Biomedical and Corrosion Resistant Applications.” Orlando, FL, March 11-15, 2012.

- D. Medlin, “Corrosion of Medical Implants.” Keynote Address, National Association of Corrosion Engineers Short Course, Omaha, NE, January 17, 2012.
- D.L. Johnson, D.J. Medlin, L.E. Murphy, J.D. Carr and D.L. Conlin, "Corrosion Rate Trajectories of Concreted Iron and Steel Shipwrecks and Structures in Seawater–The Weins Number.", CORROSION, vol. 67, No. 12, pp. 125005-1 125005-9, December 2011.
- J. Fuerst, J. Sears, M. Huber, M. Carter, D.J. Medlin, G.F. Vander Voort, “Laser Powder Deposition of Titanium – Tantalum Alloys Structured Interfaces for Use in Orthopaedic Devices.” Materials and Processes of Medical Devices Conference, Minneapolis, MN, August 8-10, 2011.
- J. Fuerst, J. Sears, K. Kennedy, M. Carter, D.J. Medlin, “The Functionality of Ti-15Mo in Creating 3-D Porous Surfaces via Laser Powder Deposition for the Use in Dental Prosthetics.” Materials and Processes of Medical Devices Conference, Minneapolis, MN, August 8-10, 2011.
- D. Conlin, D. Johnson, D. J. Medlin, and J. Carr, "Risk assessment Issues for Potentially - Polluting Wrecks -USS Arizona." World of Wrecks Conference II, Maritime Institute of Technology and Graduate Studies, Linthicum Heights, Maryland, June 6-7, 2011.
- Kelley, A., Ryno, T., and Medlin, D. "Effects of Thermal Aging on SAC305 Solder-Copper Substrate Interface", Proceedings of the International Forum-Competition of Young Researchers: Topical Issues of Subsoil Usage" Saint Petersburg Mining Institute, GV Plekhanov. Saint Petersburg, Russia. April 20, 2011.
- Kelley, T. Ryno, and D. Medlin, "Effect of Thermal Conditions and Durations on Reaction Kinetics and Phase Transformations within SAC 305 Solder", IPC APEX Expo 2011 Conference Proceedings. Las Vegas, NV, April 13, 2011.
- J. Sears, J. Fuerst, and D. Medlin, “Laser Additive Manufacturing for Surface Modification of Orthopedic Medical Devices”, MS&T Conference and Proceedings, Houston, TX, October 19, 2010, pp. 434-441.
- T. Ryno, A, Kelley, J. Metzger, D. Medlin, “Effect of Soldering Parameters on the Reaction Kinetics and Phase Transformations of SAC-305 Solder.”, *MS&T-10*, Conference Proceedings, Houston, TX, October 18, 2010, pp 636-647.
- D. Johnson, D. Medlin, J. Carr, D. Conlin, M. Russell, “Modeling the Decay Trajectory of Shipwrecks and Artifacts in Seawater – The Weins Number.”, MS&T Conference and Proceedings, Houston, TX, October 19, 2010.
- J. Fuerst, J. Sears, D. J. Medlin, D. Neufeld, T. Yescas. “LASER Deposited Engineered Surfaces for Orthopaedic Implants for Increased Device Longevity.” *Medical Device Materials V*: Proceedings of the Materials and Processes for Medical Devices Conference. Minneapolis, MN, August 10-12, 2009, Ed. J. Gilbert, pp 195-200.
- Kellar, J., Howard, S., West, M., Cross, W., Medlin, D. and Kellogg, S.., “The Samurai Sword Project and Opportunities for Metallurgical Programs,” *MS&T 2009*, Conference Proceedings, Pittsburgh, PA, September 2009, pp 2787-2798.
- L. Nielson, T. Ryno, D.J. Medlin, C. Voyles, S. Richards, “Effect of Thermal Treatments on Copper Dissolution of SAC 305 Solder, *MS&T 2009*, Conference Proceedings, Pittsburgh, PA, September 2009, pp 2647 – 2659.
- West, M., Medlin, D., Kellar, J., Mitchell, D., S. Kellogg, and J. Rattling Leaf, “Back in Black: Innovative Curricular, Outreach and Recruiting Activities at the South Dakota School of Mines and Technology,” *MS&T 2009*, Conference Proceedings, Pittsburgh, PA, September 2009, pp 2776-2786.
- J. Fuerst, J. Sears, K. Kennedy, D. Medlin, The Minerals, Metals & Materials Society (TMS) 138th Annual Meeting and Exhibition, “High Performance Titanium Osteoconductive Coatings for Medical Implant Applications,” February 17, 2009.
- Medlin, D., West, M., Mitchell, D., Kellar, J., and Kellogg, S., “Improved Materials Science Understanding with Blacksmithing,” Proceedings (AC 2009-2228) ASEE 2009 Annual Meeting, Austin, TX, June 2009, https://peer.asee.org/5751.
- D. Johnson, L. Murphy, D. Conlin, M. Russell, D. Medlin, “Recent Developments and Application of Concretion Equivalent Corrosion Rate (CECR) Methodology”, International Journal of Archaeology, November 2008.
- D.J. Medlin, “New Developments in Orthopedic Metallic Implant Materials”, Materials and Processes for Medical Devices 2008, *Keynote Presentation*, Cleveland, OH, ASM-International, August 12, 2008.
- S.K. Chimbli, D.J. Medlin, W. Arbegast, “Minimizing Lack of Consolidation Defects in Friction Stir Welds*”,* Friction Stir Welding and Processing –IV, 2007 TMS Annual Meeting, February 26, Orlando, FL.

- C. Standen, B. Jasthi, D.J. Medlin, W. Arbegast, “Liquid Metal Embrittlement of MP-159 Pin Tools”, Friction Stir Welding and Processing –IV, 2007 TMS Annual Meeting, February 26, Orlando, FL.
- C. Allen, D.J. Medlin, C. Oberebt, H. Mercer, W. Arbegast, “Friction Stir Welding of Aluminum Coal Railcars”, Friction Stir Welding and Processing –IV, 2007 TMS Annual Meeting, February 27, Orlando, FL.
- D.J. Medlin, “New Materials and Processes for Orthopedic Applications”, *Materials, Medicine, and Nanotechnology Summit*, Cleveland Clinic, ASM-International, October 2, 2006, *Invited Lecture.*
- D.J. Medlin, R. Shetty, and J. Scrafton, “Metallurgical Attachment of a Porous Tantalum Foam to a Titanium Substrate for Orthopaedic Applications”, ASTM Symposium on Titanium, Niobium, and Tantalum for Medical and Surgical Applications, *Journal of ASTM International*, Volume 2, Issue 10, November/December 2005, paper ID JAI12777.
- D.J. Medlin, G. Lucas, and G. Vander Voort, “Metallographic Analysis of Metallic Porous Coatings for Orthopedic Applications”, *Medical Device Materials – II*, Medlin and Helmus Editors, ASM-International, May 2005, pp 75-80.
- D.J. Medlin, “Future Challenges for Metals in Orthopedic Implant Devices”, *Advanced Materials and Processes*, ASM-International, November, 2004, pp 11-12.
- D.J. Medlin and R. Compton, “Metallography of Biomedical Orthopedic Alloys”, ASM Handbook, volume 9, *Metallography and Microstructures*, American Society for Materials – International, Materials Park, OH, December 2004, pp 961-968.
- D.J. Medlin, S. Charlebois, D. Swarts, R. Shetty, and R. Poggie, “Metallurgical Characterization of a Porous Tantalum Biomaterial (Trabecular Metal) for Orthopaedic Implant Applications”, *Medical Device Materials*, Proceedings of the Material and Processes for Medical Device Conference, September 8-10, 2003, Editor S. Shrivastava, ASM-International, pp. 394-399.
- C. Panchison, D.J. Medlin, and R. Shetty, “Laser Spot Welding of Fiber Metal Porous Surfaces for Orthopaedic Implant Applications”, *Medical Device Materials*, Proceedings of the Material and Processes for Medical Device Conference, September 8-10, 2003, Editor S. Shrivastava, ASM-International, pp. 54-60.
- D.J. Medlin, “Processing Microstructure and Performance of Metallic Orthopaedic Medical Devices”, *Proceedings of Microscopy and Microanalysis 2003*, edited by D. Piston, J. Bruley, et.al., Cambridge University Press, San Antonio, TX, August 4, 2003, volume 9, p.542.
- C.R. Blanchard, D.J. Medlin, and R. Shetty, “Advances in Metals”, in *Joint Replacements and Bone Resorption: Pathology and Clinical Practice*, edited by A. Shanbhab, H. Rubash, and J. Jacobs, Marcel Dekker Press, New York, 2003, pp 559-592.
- D.J. Medlin, “The Development of Metals Used in Orthopedic Implants”, Notre Dame Chapter, American Society for Materials – International, Winona Lake, Indiana, March 25, 2003, (presentation only).
- D.J. Medlin, “Carburizing Concepts”, Materials Solutions Conference and Exposition, St Louis, MO, October 10, 2000, (presentation only).
- D.J. Medlin, “Advances in Bearing Materials and Process Technologies”, Canton-Akron Chapter ASM-International, Canton, OH, September 13, 1999 (presentation only).
- D.J. Medlin, B. Cornellisson, G. Krauss, and D.K. Matlock, “Effect of Carbon Potential and Various Heat Treatments of the Bending Fatigue of Carburized Steel”, *SAE Technical Paper #1999-01-0603*, Society of Automotive Engineers 1999 Conference and Exposition, March 1-4 1999.
- T.J. Favenyesi, D.J. Medlin, D.K. Matlock, and G. Krauss, “The Effect of Prior Microstructure on the Fatigue of Induction Hardened AISI-1050 Steel”, 40th Mechanical Working and Steel Processing Conference Proceedings, Iron and Steel Society, 1998, pp. 733-740.
- J. Cunningham, D. Medlin and G. Krauss, “Effects of Induction Hardening and Prior Cold Work on a Microalloyed Medium Carbon Steel”, Proceedings of the 17th Heat Treating Society Conference, The First International Induction Hardening Symposium, ASM-International, September 16, 1997, Indianapolis, IN, pp. 575-584.
- W.N. Weins, D. Medlin and C. Wylie, "The Decomposition of Retained Austenite to Isothermal Martensite in Case Carburized 4320 Steel", Symposium on Retained Austenite and Mechanical Behavior, 1996 Materials Week, Cincinnati, OH, October 8, 1996, (presentation only).
- C. Ericksen, D. Medlin, and G. Krauss, "Effect of Bismuth, Selenium, and Tellurium on the Hot Workability of SAE-8620 Steel", Symposium on the Effects of Residual Elements on the Processing and Properties of Steel Products", Proceedings of 38th Mechanical Working and Steel Processing

Conference, Volume XXXIV, Cleveland, OH, October, 14, 1996, pp. 601-610.
- D. Medlin, “X-ray Diffraction Techniques for Particle Size Analysis in Case Carburized Components”, Materials Science Seminar, Metallurgical and Materials Engineering Department, Colorado School of Mines, September 12, 1996, (presentation only).
- D.J. Medlin, “The Metallurgy of Japanese Swords”, Faculty Lecture, Metallurgical and Materials Engineering Department, Colorado School of Mines, July, 1996, (presentation only).
- W.N. Weins, J. Makinson, Y. Xu, R. DeAngelis, and D. Medlin, "Diffracting Particle Size Analysis of Martensite-Retained Austenite Microstructures", Proceedings of 45th Annual Denver X-Ray Conference, August 7, 1996, Denver, Colorado, pp. 212-220.
- J. Cunningham, D. Medlin, C. Van Tyne, and G. Krauss, "Induction Hardening of Microalloyed Medium Carbon Steel: Characterization of Pre-Hardened Microstructure", in Fundamentals and Applications of Microalloyed Bar and Forging Steels, The Metallurgical Society, July 10, 1996, pp. 491-506.
- D. Medlin, "Microstructures and Heat Treatment Response of Induction Hardened Steels", in Heat Treating: Proceedings of the 16th Conference, Edited by J.L. Dossett and R.E. Luetje, ASM Heat Treating Society, 1996, pp. 90-97.
- S.C. Jung, D. Medlin, and G. Krauss, "Effects of Subzero Treatments on the Bending Fatigue Performance of Carburized SAE-4320 and SAE-9310 Steels", in New Steel Products and Processing for Automotive Applications, SAE paper #960313, 1996 SAE Congress and Exposition, pp. 147-158.
- D. Medlin, G. Krauss and D. Matlock, "Effects of Shot Peening and the Bending Fatigue Performance of Carburized Steels", in New Steel Products and Processing for Automotive Applications, SAE paper #960316, 1996 SAE Congress and Exposition, pp. 167-175.
- D. Medlin, G. Krauss, and D. Matlock, "Fatigue and Fracture Mechanisms of Carburized Steel", Chrysler Motors Steel Research Symposium, Chrysler Motors Technology Center, Detroit, Michigan, March 4, 1996, (presentation only).
- K. Evanson, M. Patel, D. Medlin, and G. Krauss, "Bending Fatigue Behavior of Vacuum Carburized AISI-8620 Steel", in *Carburizing and Nitriding with Atmospheres*, Edited by J. Grosch, J. Morral, and M. Schneider, Cleveland, Ohio, December 1995, pp. 61-70.
- C. Wylie, D. Medlin, and W. Weins, "Isothermal Decomposition of Retained Austenite in Carburized SAE-4320 Steel", Proceedings of the 28th International Metallographic Society Convention, July 1995, (presentation only).
- D. Medlin, "Physical Metallurgy of Induction Hardened Components", Gear Research Institute, Annual Technical Meeting, August 30, 1995, Chicago, Illinois, (presentation only).
- W. Weins, J. Makinson, Y. Xu, and D. Medlin, "Techniques for the Determination of Particle Size and Texture in Retained Austenite/Martensite Microstructures and Interpretation of the Measurements", *Advances in X-Ray Analysis*, 36, 1996, pp. 473-479.
- D. Medlin, "Induction Hardening Response of 1550 and 5150 Steels with Similar Prior Microstructures, in *Proceedings of the First International Conference on Induction Hardening Gears and Critical Components*, Edited by R. Leachman, May 16, 1995, Indianapolis, Indiana, pp 57-67.
- D. Medlin, G. Krauss, and D. Matlock, "Grain Size Control of Carburized 8620 Steels", Chrysler Motors Steel Research Symposium, Chrysler Motors Technology Center, Detroit, Michigan, March 2, 1995, (presentation only).
- D. Medlin, G. Krauss, D. Matlock, M. Slane, and K. Burris, "Comparison of Bending Fatigue From Single Tooth Component and Cantilever Beam Specimen Testing of Carburized Steel", *SAE paper #950212*, SAE International Congress and Exposition, Detroit, Michigan, March 1, 1995.
- D.J. Medlin, W.N. Weins, J. Makinson, T.R. Smith, and M. Donnley, "Quality Assurance of Case Carburized Components Using X-Ray Diffraction Measurements of Retained Austenite", *43rd Denver X-Ray Conference Proceedings*, Steamboat Springs, Colorado, August 3, 1994, (presentation only).
- D. Medlin, "Transformation of Retained Austenite Due to Rolling Contact Measured by X-ray Diffraction, Materials Science Seminar, Metallurgical and Materials Engineering Department, Colorado School of Mines, September 8, 1994, (presentation only).
- D. Medlin, W. Weins, and R. Lawrence, "Phase Transformations in a Case Carburized Bearing Steel Due to Rolling Contact", *Microstructural Science*, Vol. 20, 25th International Metallographic Society, Denver, Colorado, 1992, pp. 383-394.
- D. Medlin, "Transmission Electron Microscopy Techniques in Case Carburized Steel Materials", Electron Microscopy Society, Lincoln, Nebraska, September 14, 1990, (presentation only).
- D. Medlin, W. Weins, and A. Dhir, "Electron Microscopy of Case Carburized Tapered Rolling Bearing

Steels", *Microstructural Science*, Vol. 18, Edited by T. Place, J. Braun, W. White, 22nd International Metallographic Society, Charlotte, NC, 1989, pp. 347-359.

Books & Conference Proceedings

- B. James and D.J. Medlin, Volume Editors, *Medical Device Materials-VI,* Proceedings of the Materials and Processes for Medical Devices Conference, August 8-12, 2011 ASM-International.
- M. Helmus and D.J. Medlin, Volume Editors, *Medical Device Materials – II*, Proceedings of the Materials and Processes for Medical Devices Conference, August 25-27, 2004, St. Paul, MN, ASM-International.
- H. Kuhn and D.J. Medlin, Volume Co-Editors, "*Mechanical Testing and Evaluation*", ASM Handbook, Volume #8, Tenth Edition, 1013 pages, ASM-International, September 2001.

Patents

- D. Medlin and S. Fromm, "Method of Coating Tissue to Promote Soft Tissue and Bone Healing, Involving Nanotechnology, and Photonic Curing System for Use in Repairing Tissue", US Patent # 9,211,114, December 15, 2015.
- J. Fuerst and D.J. Medlin, "A Biomedical Implant", US Patent Application #14859583, September 9, 2015.
- Charlebois, Gilbertson, Medlin, Hawkins, et.al., "Method for Attaching a Porous Metal Layer to a Metal Substrate", *United States Patent # 8,985,430,* March 24, 2015.
- Charlebois, Gilbertson, Medlin, Hawkins, et.al, "Method for Attaching a Porous Metal Layer to a Metal Substrate", *United States Patent # 8,191,760,* June 05, 2012.
- Charlebois, Clarke, Medlin, Scrafton, et.al, "Method for Attaching a Porous Metal Layer to a Metal Substrate", *United States Patent # 7,918,382*, April 05, 2011.
- Medlin, Charlebois, Clarke, Scrafton, et.al, "Method for Attaching a Porous Metal Layer to a Metal Substrate", *United States Patent # 6,945,448*, September 20, 2005.
- D. J. Medlin, "Case Hardened Orthopedic Implant", US Patent Application, in review, May 12, 2007.

University and Professional Teaching Experience

- Failure Analysis Engineering, undergraduate/graduate level, Materials Joining & Welding Engineering, LeTourneau University.
- Welding Metallurgy 1, undergraduate level, Materials Joining & Welding Engineering, LeTourneau University.
- Thermodynamics and Kinetics of Materials Engineering, undergraduate level, Materials Joining & Welding Engineering, LeTourneau University.
- Materials Characterization Laboratory, undergraduate level, Materials Joining & Welding Engineering, LeTourneau University.
- D.J. Medlin, "STEELS: Processing, Structure and Performance", 3-day (24 hours) Short Course, Taught at ASM-International, Materials Park, OH, Taught 2 to 3 times a year since 2016.
- *"Forensic Engineering"*, undergraduate/graduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits, <u>new course at SDSM&T.</u>
- *"Corrosion Engineering"*, undergraduate/graduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits.
- *"Introduction to Biomaterials Engineering"*, undergraduate/graduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits, <u>new course at SDSM&T</u>.
- *"Metallurgical Engineering Junior Design"*, undergraduate/graduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits, Taught every year.
- *"Professionalism in General Engineering"*, undergraduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 1 credits, Fall 2006.
- *"Properties of Materials"*, undergraduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits, spring 2006, 65 students.
- *"Mechanical Metallurgy"*, and laboratory, undergraduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 4 credits.
- *"Physics of Metals"*, and laboratory, undergraduate/graduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 4 credits.
- *"Processing and Joining Methods",* undergraduate/graduate level, Materials and Metallurgical

Engineering Department, South Dakota School of Mines and Technology, 3 credits.
-*"Thermo-Mechanical Processing"*, undergraduate level, Materials and Metallurgical Engineering Department, South Dakota School of Mines and Technology, 3 credits.
-"*Structure of Materials and X-Ray Diffraction*", graduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 3 credits.
-"*Materials Science Engineering*", undergraduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 3 credits, substituted on as needed basis, Fall 1995 - Fall 1996.
-"*Materials and Manufacturing Methods in Engineering*", undergraduate level, Metallurgy and Materials Engineering Department, Colorado School of Mines, 3 credits, spring 1996, 28 students.
-"*Dislocation Theory*", graduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 3 credits, fall 1995, 8 students.
-"*Mechanical Metallurgy*", graduate/undergraduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 4 credits (with lab), taught 25% of the course, fall 1995.
-"*Alloying and Phase Stability*", graduate/undergraduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 3 credits, substituted on as needed basis, spring 1995.
-"*Structure of Materials*", undergraduate level, Metallurgical and Materials Engineering Department, Colorado School of Mines, 4 credits (with lab), Substituted on as needed basis, fall 1994.
-"*Selection of Metals: Aluminum and Aluminum Alloys*", Short Course, Sponsored by ASM-Rocky Mountain Chapter and Colorado School of Mines, April 9, 1994.
-"*Steel and Alloy Design*", undergraduate/graduate, Mechanical Engineering Department, University of Nebraska-Lincoln, 3 credits, fall 1993, 14 students.
-*"Corrosion Engineering",* graduate/undergraduate, Mechanical Engineering Department, University of Nebraska-Lincoln, 3 credits, substituted on an as needed basis, fall 1992.
-"*Materials Science Laboratory II*", graduate/undergraduate, Mechanical Engineering Department, University of Nebraska-Lincoln, 2 (3 hour) laboratories per week, fall 1991.
-"*Materials Science Laboratory I*", undergraduate, Mechanical Engineering Department, University of Nebraska-Lincoln, 2 (3 hour) laboratory sections per week, spring and fall 1988-1990.

Professional Affiliations & Activities

- ASM Education Committee Chairman, ASM International, Materials Park, OH, 2017-2018.
- ASM Technical Handbook Committee, 1997 - 2009, 2014 – Present.
- Association of Firearm and Tool Mark Examiners (AFTE) – Technical Advisor Member 2017 - Present
- ASM Nominating Committee for Board of Trusties and Vice President, ASM-International, Materials Park, OH, April 15, 2016.
- ASM Award Selection Committee, 2014 – 2015.
- "*Materials Characterization"*, Editorial Review Board, 2006 – 2010.
- Materials for Medical Devices Task Force, Original Committee Member, 2001 – Present.
- Conference Co-Chairman, *Materials and Processes for Medical Devices*, August 8-10, 2011, Minneapolis, MN.
- Conference Co-Organizer, *Materials, Medicine, and Nanotechnology Summit*, Cleveland Clinic, October 2-5, 2006, Cleveland, OH.
- Conference Co-Chairman, *Materials and Processes for Medical Devices*, August 25-27, St Paul, MN.
- Symposium Co-Organizer, *George Krauss Symposium on Ferrous Metallurgy*, ASM Materials Week, 1999, Cincinnati, OH.
- Subcommittee E04, Metallography, Voting Member Status, 1999 – Present.
- Subcommittee F04, Medical and Surgical Materials and Devices, Voting Member Status, 2001 – Present.
- Director of the Biomedical Engineering (BME) Graduate Program.
- BME Program Development Committee Member.
- Tenure and Promotion Committee.
- Materials Engineering & Science Graduate Committee.
- Biomedical Engineering Graduate Committee.
- SDSMT Scholarship Committee.
- Various Search Committees (VP Academics, MET, BME, Chemistry, and ME)
- Academic Advisor for SAE Supermileage Team.

- Advisor for Blacksmithing Club.
- Undergraduate and Graduate Student Advisor.
- "Professional Engineering Examination Review Course for Metallurgical Engineering", The Metallurgical Society, Professional Engineering Examination Committee, Warrendale, PA, 4-hour course, August 20-21, 2015.
- "Metallurgy for the Non-Metallurgist", Association of Firearm and Tool Mark Examiners, Dallas, TX, 8-hour seminar, May 28, 2015.
- Organizing Committee, First International Conference of Materials and Processes for Medical Devices, September 8-10, 2003, Anaheim, CA.
- Technical Programming Board, Annual ASM Materials Week Conference, 1998-2001.
- Co-Chair, ASM Heavy Equipment Committee, 1996-2001.
- Session Organizer and Chair – Heavy Equipment Sessions, *Carburizing and Heat Treatments for the Heavy Equipment Industry*, ASM Materials Week 2000, St. Louis, MO.
- Session Chair - Heavy Equipment Session, ASM Materials Week 1997, Indianapolis, IN.
- Session Chair, Microscopy and Microanalysis 2006, Chicago, IL, July 30 – August 3, 2006.
- Committee Judge, IMS Metallographic Contest, Microscopy and Microanalysis 2006, Chicago, IL, July 30 – August 3, 2006.
- Technical Session Organizer and Chairman, *Metallography and Microstructure of Ferrous Components*, 2001, IMS Materials, Week, 2001, Indianapolis, IN.
- Session Chair, 1999 IMS Materials Week, Cincinnati. OH.
- Program Director/Vice Chairman, Canton-Massillon Chapter, ASM-International, 1999-2000.
- Secretary, Canton-Massillon Chapter, ASM-International, 1998-1999.
- Executive Committee, Canton-Massillon Chapter, ASM-International, 1998-2000.
- Chairman, Rocky Mountain Chapter, ASM-International 1996-1997.
- Vice-Chair/Program Director, Rocky Mountain Chapter, ASM-International, 1996-1997.
- Secretary/Treasurer, Rocky Mountain Chapter, ASM-International, 1995-1996.
- Executive Committee, Rocky Mountain Chapter, ASM-International, 1995-1997.
- Membership Education, Rocky Mountain Chapter, ASM-International, 1994-1995.

Memberships

- American Society for Materials International, Member (1988 – Present)
- Failure Analysis Society, ASM International, Member, (2018 – Present)
- International Metallographic Society, Member (1990 – Present)
- American Society for Testing Materials, Member (1998 – Present)
  - F04 (Medical Materials Subcommittee)
  - E04 (Metallography Subcommittee)
- The Metallurgical Society, Member (1996 – Present)
- Professional Engineering Examination Board, Member (2008 – Present)
- Professional Engineering Examination Review Committee, Member (2014–Present)
- Society for Biomaterials, Associate Member (2001 – Present)
- Society of Automotive Engineers, Member (1994 – 2001)
- The Iron & Steel Society, Member (1994 – 2001)
- National Association of Corrosion Engineers, Member (1998 – 1993, 2011 – Present)

Honors/Awards

- Honored as the Kielhorn Professor of Materials Joining & Welding Engineering at LeTourneau University.
- Honored as a Fellow of Alpha Sigma Mu, International Professional Honor Society for Materials Science and Engineering, October 4th, 2016, "*Having achieved and maintained throughout a distinguished career a seminal international standing in materials science and engineering profession*".
- Awarded Tenure and Professor, South Dakota School of Mines & Technology, 2011.
- Honored as the NUCOR Professor of Metallurgy, South Dakota School of Mines & Technology, May 2009.
- Honored as a Fellow of ASM, July, 2007, for outstanding contributions to the field of metallurgical and materials engineering, as well as leadership and contributions to ASM.

- LTV Steel Special Achievement Award for Analysis of Surface Defects in Sheet Steel Technology, Customer Technical Center Award, September 1998.
- 1997 Lindburg Best Technical Paper, ASM Heat Treat Society, “Effects of Induction Hardening and Prior Cold Work on a Microalloyed Medium Carbon Steel”.
- Outstanding Graduate Teaching Assistant, College of Engineering and Technology, University of Nebraska-Lincoln, 1990.

Professional Service

- American Society for Materials International (ASM)
  - Member, 1988 – Present
  - Education Committee, 2017 - Present
  - ASM Nominating Committee 2016
  - ASM Award Selection Committee, 2014 – 2015
  - ASM Technical Handbook Committee, 1997-2009 and 2014 – present
  - Honored as a Fellow of ASM, July, 2007, for outstanding contributions to the field of metallurgical and materials engineering, as well as leadership and contributions to ASM.
  - “*Materials Characterization”*, Editorial Review Board, 2006 – 2010.
  - Materials for Medical Devices Task Force, Original Committee Member, 2001 – present
  - Conference Co-Chairman, *Materials and Processes for Medical Devices*, August 8-10, 2011,
  - Minneapolis, MN.
  - Conference Co-Organizer, *Materials, Medicine, and Nanotechnology Summit*, Cleveland Clinic, October 2-5, 2006, Cleveland, OH.
  - Conference Co-Chairman, *Materials and Processes for Medical Devices*, August 25-27, St Paul, MN
  - Symposium Co-Organizer, *George Krauss Symposium on Ferrous Metallurgy*, ASM Materials Week, 1999, Cincinnati, OH.

- International Metallographic Society (IMS)
  - Member, 1990 – Present

- American Society for Testing Materials (ASTM)
  - Member, 1998 – Present
  - Subcommittee E04, Metallography, Voting Member Status, 1999 – Present
  - Subcommittee F04, Medical and Surgical Materials and Devices, Voting Member Status, 2001 – Present

- The Metallurgical Society (TMS)
  - Member, 1996 – Present

- Association of Firearm and Tool Mark Examiners (AFTE) – Technical Advisor Member 2017 – Present

- Professional Engineering Examination Board (Metallurgical Engineering)
  - Member, 2008-Present
  - Professional Engineering Review Committee and Presenter, 2015 - Present

- Society for Biomaterials
  - Associate Member, 2001 – Present

- Society of Automotive Engineers (SAE)
  - Member, 1994 – 2001

- The Iron and Steel Society (ISS)
  - Member, 1994-2001

- National Association of Corrosion Engineers (NACE)

- Member, 1988 – 1993, 2011- Present

Other Professional Activities

- "Professional Engineering Examination Review Course for Metallurgical Engineering", The Metallurgical Society, Professional Engineering Examination Committee, Warrendale, PA, 4-hour course, 2015 – 2018.
- "Metallurgy for the Non-Metallurgist", Association of Firearm and Tool Mark Examiners, Dallas, TX, 8-hour seminar, May 28, 2015 and June 2, 2018.
- Organizing Committee, First International Conference of Materials and Processes for Medical Devices, September 8-10, 2003, Anaheim, CA.
- Technical Programming Board, Annual ASM Materials Week Conference, 1998-2001.
- Co-Chair, ASM Heavy Equipment Committee, 1996-2001.
- Session Organizer and Chair – Heavy Equipment Sessions, *Carburizing and Heat Treatments for the Heavy Equipment Industry*, ASM Materials Week 2000, St. Louis, MO.
- Session Chair - Heavy Equipment Session, ASM Materials Week 1997, Indianapolis, IN.
- Session Chair, Microscopy and Microanalysis 2006, Chicago, IL, July 30 – August 3, 2006
- Committee Judge, IMS Metallographic Contest, Microscopy and Microanalysis 2006, Chicago, IL, July 30 – August 3, 2006
- Technical Session Organizer and Chairman, *Metallography and Microstructure of Ferrous Components*, 2001, IMS Materials, Week, 2001, Indianapolis, IN.
- Session Chair, 1999 IMS Materials Week, Cincinnati. OH.
- Program Director/Vice Chairman, Canton-Massillon Chapter, ASM-International, 1999-2000
- Secretary, Canton-Massillon Chapter, ASM-International, 1998-1999
- Executive Committee, Canton-Massillon Chapter, ASM-International, 1998-2000
- Chairman, Rocky Mountain Chapter, ASM-International 1996-1997
- Vice-Chair/Program Director, Rocky Mountain Chapter, ASM-International, 1996-1997
- Secretary/Treasurer, Rocky Mountain Chapter, ASM-International, 1995-1996
- Executive Committee, Rocky Mountain Chapter, ASM-International, 1995-1997
- Membership Education, Rocky Mountain Chapter, ASM-International, 1994-1995

EXHIBIT B

EAG LABORATORIES

DANA J. MEDLIN, PhD., P.E., FASM
EAG Laboratories, Inc.

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2019

CASE	STATE	DEPOSITION	TRIAL
Boltex Corp and Weldbend Corp v Ulma Forja	TX	X	
Lawrence v Mack	CA	X	
Bedra Inc., Berkenhoff and Powerway Group v Seong Chul	CA	X	
Boltex Corp and Weldbend Corp v Ulma Forja	TX	X	X
United States of America v Idaho County Light & Power	ID	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2018

CASE	STATE	DEPOSITION	TRIAL
Kaku v Alphatec Holdings	GA	X	
Allan Schauer v MDU Resources Group, Inc.	SD	X	
Forss v Redhawk Golf Course	CA	X	
Patton vs Abbott Labs, Inc.	LA	X	
Boltex Corp and Weldbend Corp v Galperti Inc	TX	X	
Embotteladora S.A. de C.V. v Accutek Packaging Equipment	CA		X

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2017

CASE	STATE	DEPOSITION	TRIAL
Hardy v Zimmer/Biomet	TX		X
Camp 34 LLP et al v Idaho County Light and Power Coop	ID	X	
Wollam v Stryker/Howmedica	CO	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2016

CASE	STATE	DEPOSITION	TRIAL
Fertik (William) v Abbott Labs, et al	MA		X
Black (Kimberly) v Globus Medical, Inc.	FL	X	
McBrayer (Donald) et al v LDR Spine USA, Inc	AL	X	
Fertik (William) v Abbott Labs, et al	MA	X	
G.H.S. Corporation v Cenveo Corporation	MI	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2015

CASE	STATE	DEPOSITION	TRIAL
Fertik (William) v Abbott Labs, et al	MA	X	
Frantz and NanoMed Systems Inc. v Medtronic Vascular (Franz Ward)	CA	X	
Todd R Tavegie, et al. v Black Hills Power Inc. (Lynn, Jackson, Shultz, & Lebrun)	SD	X	
Klynsma v. Hydradyne, LLC et al (Bradsky, Bradsky & Bradsky)	SD	X	
Ballard v. Zimmer (Walsh, Knippen, Pollock & Cetina)	IL		X

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2014

CASE	STATE	DEPOSITION	TRIAL
Linda S. O'Bryan v. Synthes, Inc. (Nexsen Pruet, LLC)	WV	X	
Mertz (Chad) v. Hamilton.net, Aramark, & Milliken & Co. (Keating, O'Gara, Nedved & Peter, P.C., L.L.O.)	NE	X	
Robert Stone and Dell Stone v. Synthes, Inc, et al. (Maynard, Cooper, and Gale)	AL	X	
Byron D. Rowe v. DePuy Orthopaedics, Inc, et al. (Barnes and Thornburg)	TX	X	
Kathleen Herlihy-Paoli v. DePuy Orthopedics, Inc, et al. (Barnes and Thornburg)	TX	X	
Tony M. Lay and Rodney E. Lay v. DePuy Orthopedics, Inc, et al. (Barnes and Thornburg)	TX	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2013

CASE	STATE	DEPOSITION	TRIAL
Strum v. Johnson & Johnson (Depuy) (Helmsing, Leach, Herlong, Newman & Rouse P.C.)	IL		X
Hart v. Synthes (Johnson & Johnson) (Thompson, Miller & Simpson)	MA	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2012

CASE	STATE	DEPOSITION	TRIAL
Strasburg v. Union Pacific Railroad and Steelcase Inc. (Keating, O'Gara, Nedved & Peter)	NE	X	X

Ballard v. Zimmer (Walsh, Knippen, Pollock & Cetina)	IL	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2011

CASE	**STATE**	**DEPOSITION**	**TRIAL**
Marshall v. Deeprock Manufacturing and Jay's Welding (Scott Schultz Law)	SD	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2010

CASE	**STATE**	**DEPOSITION**	**TRIAL**
Tredennick v. Wright Medical (Ozmon Law)	IL	X	

EXPERT DEPOSITION AND TRIAL TESTIMONY GIVEN IN 2009

CASE	**STATE**	**DEPOSITION**	**TRIAL**
Burnham et al., v. Lemke (Richardson, Wyly, Wise & Sauck)	SD	X	
White v. Cooper Tools (Davenport, Evans, Hurwitz & Smith)	SD	X	